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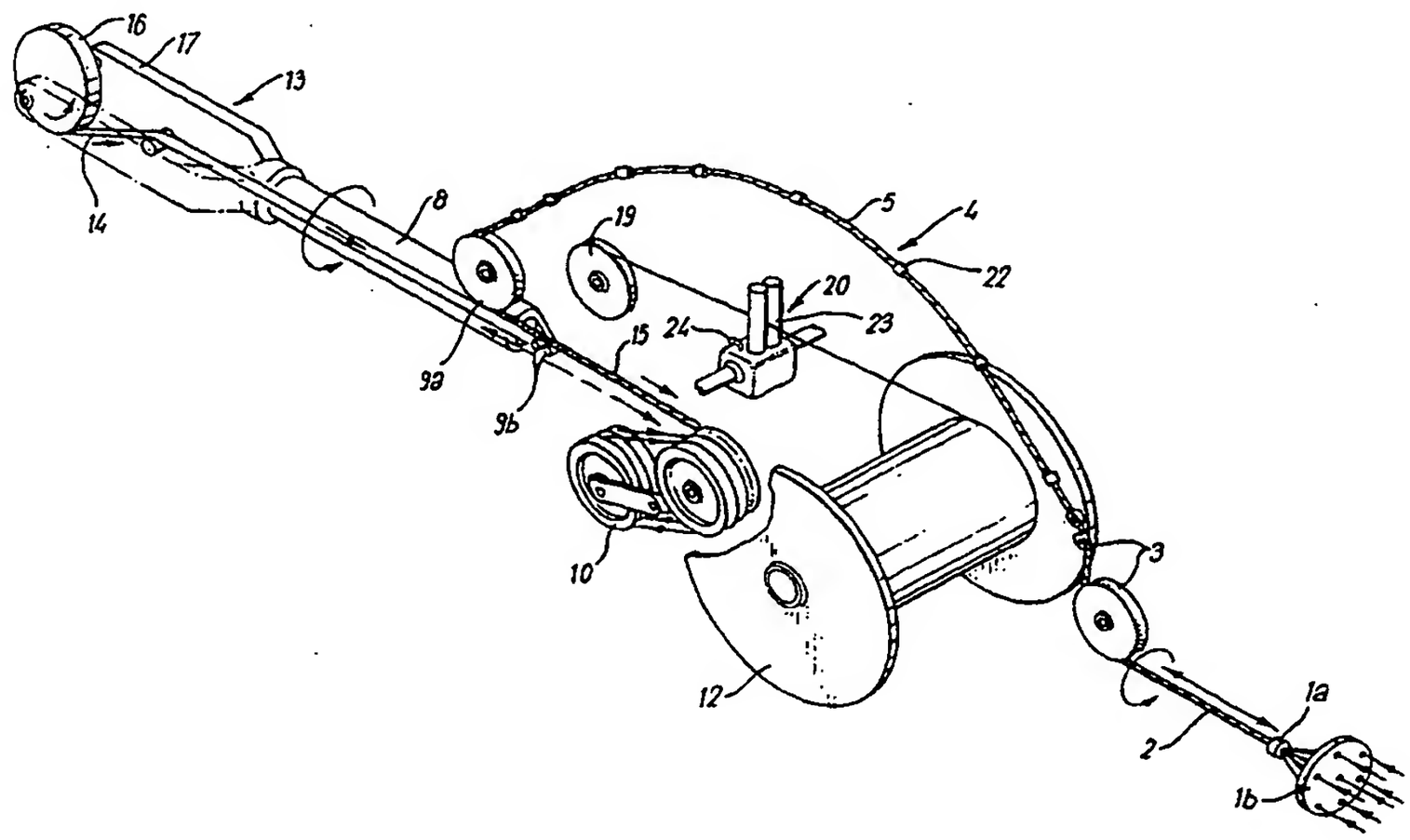

(57) Abstract

In apparatus for and a method of applying an elongate element in a double twist stranding machine, tape (14) is fed from a tape pad (16) axially through a stub axle (8) to be applied to a twisted plurality of wires (2) at the point at which a second of two twists is applied by means of a rotor (4) rotating about a cradle. As the tape is applied at the second and final twist point it is not subjected to further twisting which could cause it to wrinkle. Nor is it subjected to high centrifugal forces as it passes through the rotor (4). The tape may be fed from a concentrically wound or helically wound pad. Alternatively, the tape may be replaced by wires supplied from bobbins.

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APPARATUS FOR AND A METHOD OF APPLYING AN ELONGATE ELEMENT IN A DOUBLE TWIST STRANDING MACHINE OR BUNCHER

The present invention relates to apparatus for and a method of applying an elongate element in a double twist stranding machine or buncher.

In a double twist machine, the strand or cable receives two twists for one revolution of the machine rotor, the first twist at the entry to the rotor and the second twist where the strand passes from the rotor to the cradle. Until now tapes have usually been applied from a stationary supply onto the assembled cable before entering the rotor. The tape is thus applied at the same lay length as the cable and receives two twists at the same points as the cable.

The drawbacks to this method are that the tape tends to wrinkle after the second twist and also the tape is subjected to considerable pressure in its passage through the rotor. One method that is used to prevent the wrinkling of the tape at the second twist point is the use of a pretwister. Although this helps the situation, it can also cause the tapes to loosen at the entry to the rotor which thus makes them prone to "pushing back".

According to one aspect of the invention, there is provided a double twist stranding machine comprising a rot r, a cradle, means for feeding elongate elements t be twisted to the rotor, means f r r tating the rot r

about th cradle wh r by to impart a first twist to the elements before the elements enter the rotor and a second twist to the elements as they leave the rotor and enter the cradle and means for feeding at least one further elongate element to the cradle so that that further elongate element is wound around the first mentioned elements as the second twist is imparted thereto.

According to another aspect of the present invention, there is provided a method of stranding in a double twist stranding machine comprising a rotor operative to rotate about a cradle including the steps of feeding a plurality of elongate elements to the rotor and rotating the rotor to impart a first twist to the elements as they approach the rotor and a second twist to the elements as they leave the rotor and enter the cradle and feeding at least one further elongate element to the cradle so that that further element is wound around the plurality of elongate elements as the second twist is imparted thereto.

In a preferred embodiment of the invention, the rotor is supported at the axial end remote from the feed point of the first mentioned elongate elements on a hollow support through which the further elongate element is fed. Advantageously this hollow support comprises a stub axle. The first mentioned elongate elements are fed to the rotor through a lay plate and a wire closing die. The further elongate element is fed from a rotatable tape pay off unit. This unit comprises one or more pads of tape itself mount d in an ass ciated cradle which in turn is rotatably mounted in a supp rt. This tape unit, in operation, is rotated at the same speed and

in the same direction as the rotor. For this purpos a single drive may be provided or individual respective drives may be provided synchronised together. Alternatively, the rotatable tape pay off unit may form an extension of the stub axle and therefore rotate with it automatically in which case no drive specifically for this unit is necessary. Instead of tape the further elongate element may be wire or a group of wires. Each wire is fed from a bobbin supported on a carriage operative to rotate at the same speed and in the same direction as the axle or support. Where there are a plurality of wires they are fed through a lay plate and closing die to form a parallel group. As an alternative, the bobbins may be coaxially arranged on the centre line of the machine and provided with respective flyers all rotating at the same speed and in the same direction as the axle/support. Each bobbin defines a bore through which wires from the preceding bobbin(s) pass. In both these latter cases, after leaving the axle/support the wires are fed through lay plates before being applied to the first mentioned twisted elongate elements. The cradle comprises a take up drum, capstan wheels, pivotable guide pulley and traversing mechanism. The rotor comprises a bow including bow guide dies.

In order that the invention may be more clearly understood, several embodiments thereof will now be described, by way of example, with reference to the accompanying drawing, in which:-

Figure I shows a diagrammatic side elevational view of one form of double twist machine acc rding to the invention,

Figure 2 shows a diagrammatic perspective view f another form

of doubl twist machin according to th invention,

Figure 3 shows a diagrammatic perspective view of a further form of double twist machine according to the invention,

Figure 4 shows a diagrammatic perspective view of a still further form of double twist machine according to this invention, and

Figure 5 shows a diagrammatic perspective view of a still further form of double twist machine according to the invention.

Referring to Figure I, the double twist machine according to the invention comprises a wire closing die I, through which individual wire elements to be twisted together are fed. After leaving the die the grouped wires 2 are directed via a series of guide rollers 3 onto a rotor indicated generally by the reference numeral 4. This rotor 4 comprises a bow 5 on which the wires 2 are supported as they pass through. The bow 5 is mounted for rotation on bearings 6 and 7 at opposite axial ends. The bearings 7 are associated with a stub axle 8 at that end of the rotor 4 remote from the closing die I. At that axial end of the stub axle remote to the die I are disposed a rotor end guide pulley 9a and tape application guides 9b. Within the volume generated by the rotating bow 5 are disposed a pair of capstan wheels I0 and II, a pivotable guide pulley I9, a take-up drum I2 and a traversing mechanism 20 which together form a cradle.

A rotatable tape pay off unit I3 is disposed at that end of the stub axle remote from the rotor 4. The stub axle 8 defines a through bore through which tape I4 from the unit I3 passes to a point I5 at which it is

helically wound onto the twisted wires as they approach capstan wheel II. The unit I3 comprises a pad of tape I6 mounted in a further cradle I7 which is in turn rotatably mounted in a support I8. During operation the cradle I7 rotates at the same speed and in the same direction as the rotor 4. If desired the unit I3 can support a number of pads, the number and material thereof being chosen having regard to the cable being produced. Cradle I7 and rotor 4 may be driven individually by respective drive motors (not shown) synchronised in speed and direction of rotation or by a single drive motor through appropriate gearing (not shown). Advantageously the drive motors are electric drive motors. The wire traversing mechanism for traversing the wire fed to the take up reel reciprocates across the axial width of the take-up reel I2 during the winding operation. Rotor bow guide dies (not shown) are spaced along the bow 5.

The advantages of this machine and the proposed method of operating it are:-

I) The tape is applied at the final twist point and thus is not subjected to further twisting which would cause the tape to wrinkle.

2) The tape is not subjected to the high loads due to centrifugal force and wire tension as it passes through the rotor end, thus damage is avoided.

3) Because the tapes are not passed through the bow, higher speeds are possible. Tap is more susceptibl to damage than cable. Eyelets n the bow may ffect tape leading

edg s.

An alternative embodiment is shown in Figure 2. In this embodiment parts equivalent to the parts of the embodiment of Figure I bear the same reference numerals. The main difference between this embodiment and that of Figure I is that the rotating pay off unit I3 is formed as an extension of the stub axle 8 and thus separate drive means for this unit are unnecessary. Rotor bow guide dies referred to but not shown in Figure I are shown at 22 and the closing die Ia and lay plate Ib of the die I are shown in more detail. The twin rollers 23 and traversing mechanism 20 are also more clearly shown. Rotor end bearings 6 and 7 are not shown. The same advantages are achieved as with the embodiment of Figure I.

A further embodiment is shown in Figure 3. Again equivalent parts to the embodiments of Figure I and 2 bear the same reference numerals. In this embodiment the rotating tape supply unit I3 is replaced by a rotating carriage (not shown) which support a plurality (in this case four) of bobbins 30 of wire. Wires from the bobbins 30 pass through a lay plate 3I and closing die 32 before entering the bore of the stub axle 8 as a group of parallel wires 33 which rotate with the stub axle. On exit from the stub axle the wires pass through lay plates 34 and 35 before being applied to the twisted core and then pass through a closing die 36. This method f op ration, pr duces an outer layer of wires having a lay length equal to twic the c re lay length but in the same directi n.

A still further embodiment is shown in Figur 4. This embodiment is similar to that of Figure 3 in that a plurality of wires are supplied rather than a tape to produce the outer covering of the cable. Equivalent parts again bear the same reference numerals. A multiple wire flyer pay off indicated generally by the reference numeral 40 is provided. This pay off comprises a plurality of bobbins 4l (in this case three bobbins 4l) arranged with their axes coaxial with the centre line of the machine. Respective flyers 42 are disposed for rotation about bobbins 4l and in operation rotate at the same rotational speed and in the same direction as the rotor of the double twist machine. The bobbins 4l define centrally disposed bores through which wires from the preceding bobbin(s) pass until they all emerge from the final flyer 42 as a rotating group of parallel wires 33 each separated from the next wire. The wires would then pass through the stub axle 8 and be applied to the core strand or cable in the manner described in relation to the embodiment of Figure 3.

The advantage of the rotating flyer supply is that the bobbins 41 not being subjected to centrifugal force could be larger and due to the lightweight of the flyers 42 higher speeds could be achieved.

Figure 5 illustrates a still further embodiment of the invention. This embodiment is a modification of that shown in Figure 2, in which the tape supply unit 13 is replaced by a tape supply unit 53 arranged to supply tape from a helically wound tape pad. Guide rollers 54 are provided to guide the tape from th pad to the entry to the stub axle 8. In other respects th arranged is the same as the arrangem nt of Figure 2

equivalent parts bearing the sam r ference numerals.

It will be appreciated that the above embodiments have been described by way of example only and that many variations are possible without departing from the scope of the invention

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CLAIMS

1. A double twist stranding machine comprising a rotor (4), a cradle (10, 11, 12, 19, 20) means for feeding (3) elongate elements (2) to be twisted to the rotor (4) and means for rotating the rotor (4) about the cradle (10, 11, 12, 19, 20) whereby to impart a first twist to the elements (2) before the elements (2) enter the rotor (4) and a second twist to the elements (2) as they leave the rotor (4) and enter the cradle (10, 11, 12, 19, 20) characterised by means for feeding (13) at least one further elongate element (16) to the cradle so that that further elongate element is wound around the first mentioned elements (2) as the second twist is imparted thereto.

2. A double twist stranding machine as claimed in claim 1, in which the rotor (4) is supported at the axial end remote from the feed points of the first mentioned elongate elements (2) on a hollow support (8) through which the further elongate element is in operation fed.

3. A double twist stranding machine as claimed in claim 1 or 2, in which the means for feeding (3) elongate elements to be twisted to the rotor (4) comprises a lay plate and wire closing die (1).

4. A double twist stranding machine as claimed in claim 1, 2 or 3, in which the means for feeding (13) at least one further elongate element (16) comprises a rotatable tape pay off unit.

5. A double twist stranding machine as claimed in claim 4, in which the means for fe ding (13) the at least ne furth r el ngate element comprises a rotatable tape pay off unit having on r more pads

of tape (16) mounted in an associated cradle (17), mounted in turn in a support (18).

6. A double twist stranding machine as claimed in claim 5, in which the rotatable tape pay off unit is arranged to feed tape from one or more concentrically wound pads of tape.

7. A double twist stranding machine as claimed in claim 5, in which the rotatable tape pay off unit is arranged to feed tape from one or more helically wound pads of tape.

8. A double twist stranding machine as claimed in any preceding claim, in which means are provided for rotating the means for feeding (13), the at least one further elongate element at the same speed and in the same direction as the rotor (4).

9. A double twist stranding machine as claimed in claim 8, in which the means for rotating comprises a single drive which is also operative to rotate the rotor (4).

10. A double twist stranding machine as claimed in claim 8, in which the means for rotating the means for feeding (13), and the means for rotating the rotor comprise respective drives synchronised together.

11. A double twist stranding machine as claimed in any of claims 1 to 7, in which the means for feeding (13) the at least one further elongate element (16) comprises an extension of a support for the rotor and, in operation, rotates with it.

12. A double twist stranding machine as claimed in any of claims 1 to 3, in which the means for feeding (13) the at least one further

longate element compris s a carriag having a plurality of wir bobbins (30), a lay plate (31) through which wires from the bobbins in operation pass and a closing die (32).

13. A double twist stranding machine as claimed in any of claims 1 to 3, in which the means for feeding (13) the at least one further elongate element comprises a multiple wire flyer pay off (40) comprising a plurality of coaxially aligned bobbins (41), respective flyers (42) disposed for rotation about respective bobbins (41), the bobbins (41) defining centrally disposed bores through which, in operation, respective wires from preceding bobbins to emerge as a rotating group of parallel wires (33) from the last of the bobbins (41).

14. A double twist stranding machine as claimed in any preceding claim, in which the cradle comprises a take up drum (12), capstan wheels (10, 11) pivotable guide pulley (19) and traversing mechanism (20).

15. A method of stranding in a double twist stranding machine comprising a rotor (4) operative to rotate about a cradle (10, 11, 12, 19, 20) including the steps of feeding a plurality of elongate elements (2) to the rotor and rotating the rotor (4) to impart a first twist to the elements (2) as they approach the rotor (4) and a second twist to the elements (2) as they leave the rotor (4) and enter the cradle characterised by feeding at least one further elongate element (16) to the cradle so that that further element (16) is wound around the plurality of elongate elements (2) as the sec nd twist is imparted th reto.

16. A method f stranding in a double twist stranding machin as

claimed in claim 15, in which the means for f eding (13) at l ast on further element are rotated at the same speed and in the same direction as the means for rotating the rotor.

17. A method of stranding in a double twist stranding machine as claimed in claim 16, in which the means for feeding and the rotor are driven from the same drive means.

18. A method of stranding in a double twist stranding machine as claimed in claim 17, in which the means for feeding and the rotor are driven from respective drive means synchronised together.

19. A method of stranding in a double twist stranding machine as claimed in claims 16, 17 or 18, in which the further elongate element is a tape fed from a concentrically wound pad.

20. A method of stranding in a double twist stranding machine as claimed in claims 16, 17 or 18, in which the further elongate element is a tape fed from an helically wound pad.

21. A method of stranding in a double twist stranding machine as claimed in claims 16, 17 or 18, in which the further elongate element is a wire.

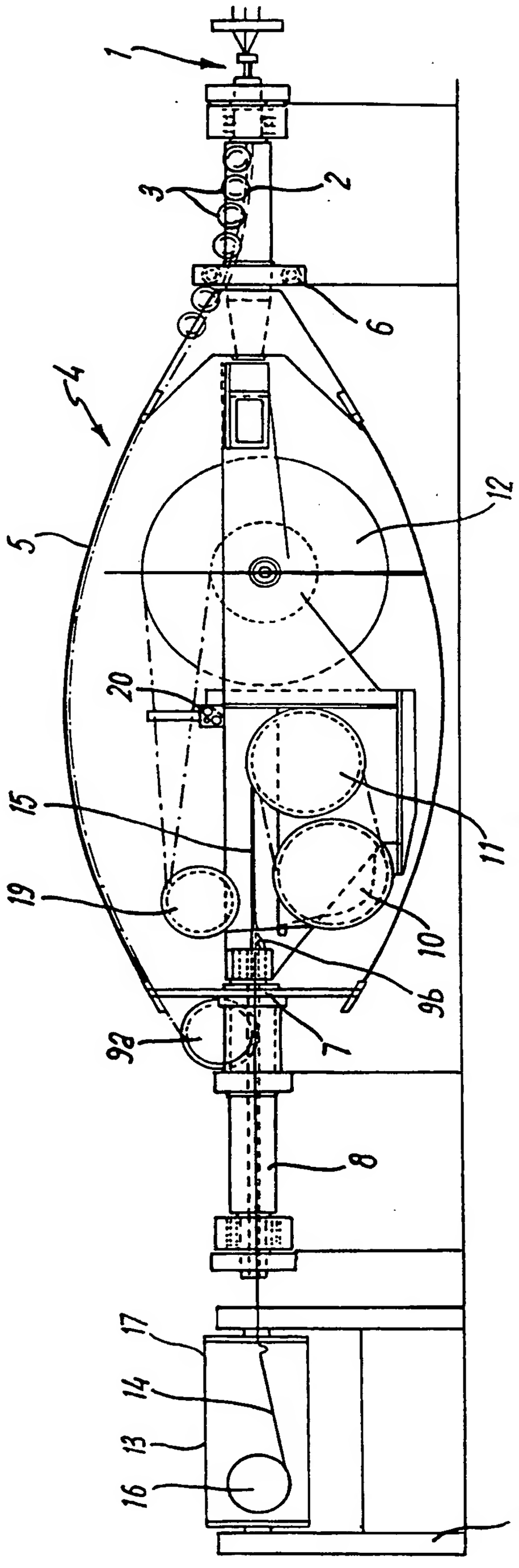

Fig.1

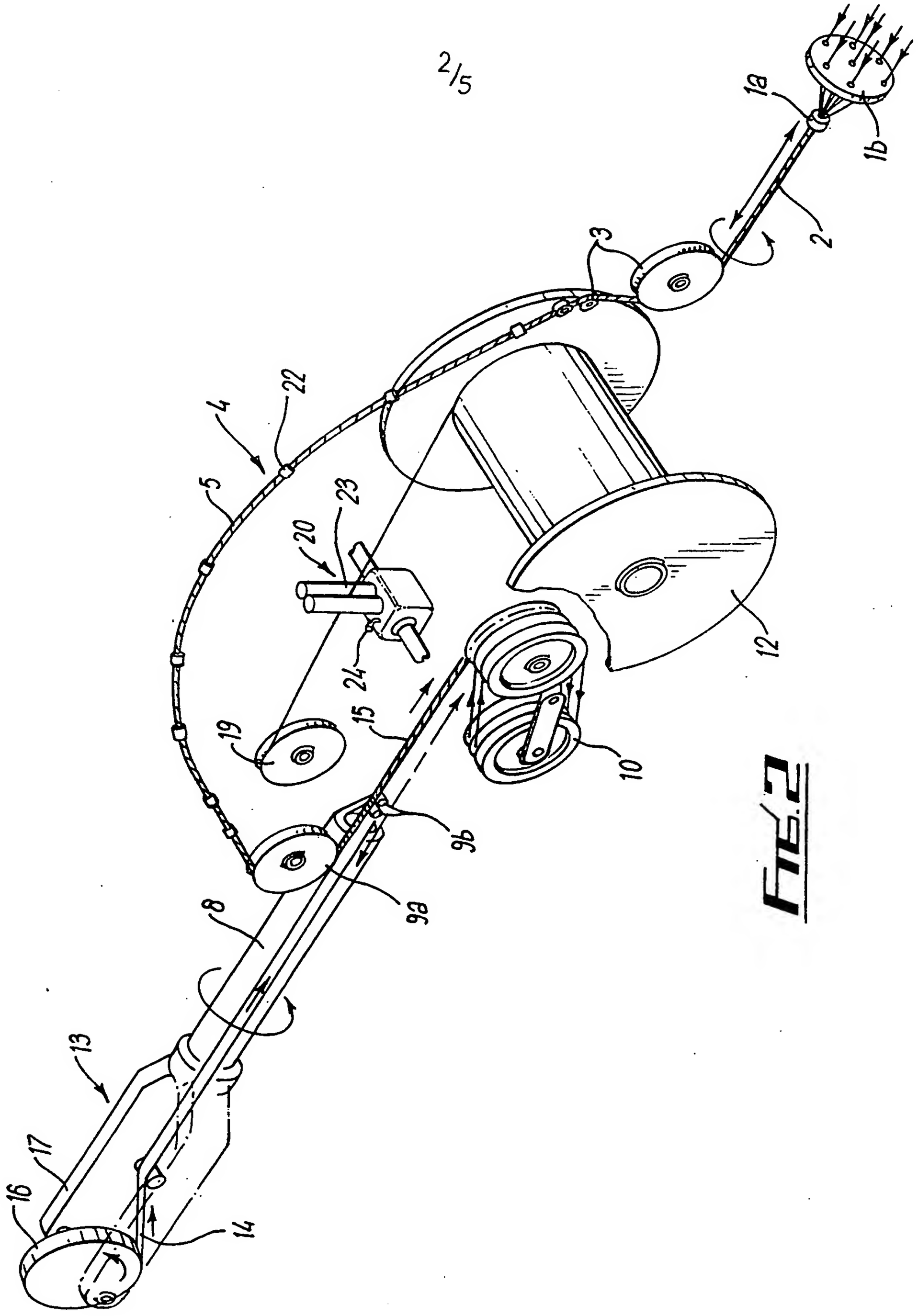

FIG.2

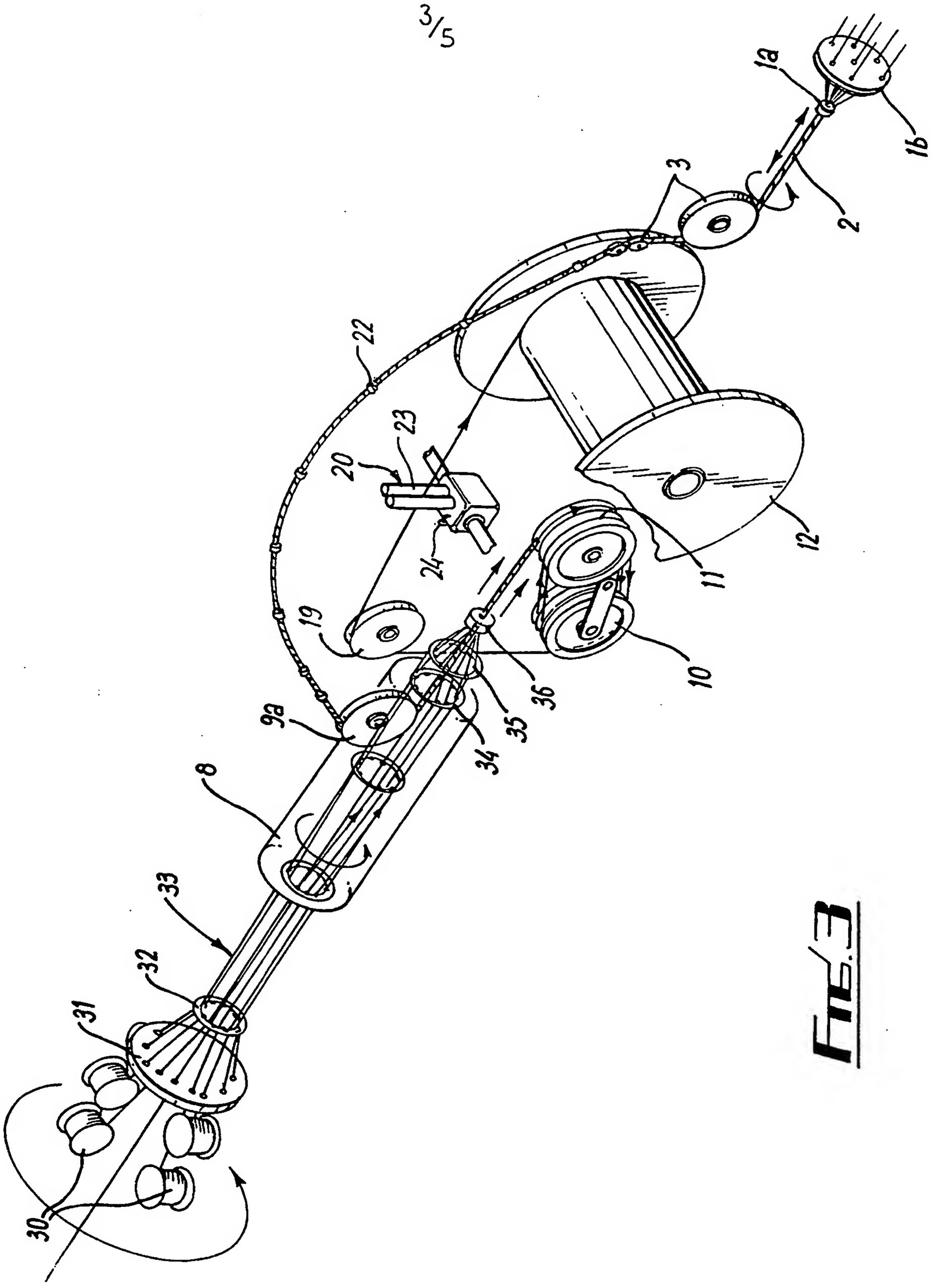

FIG.3

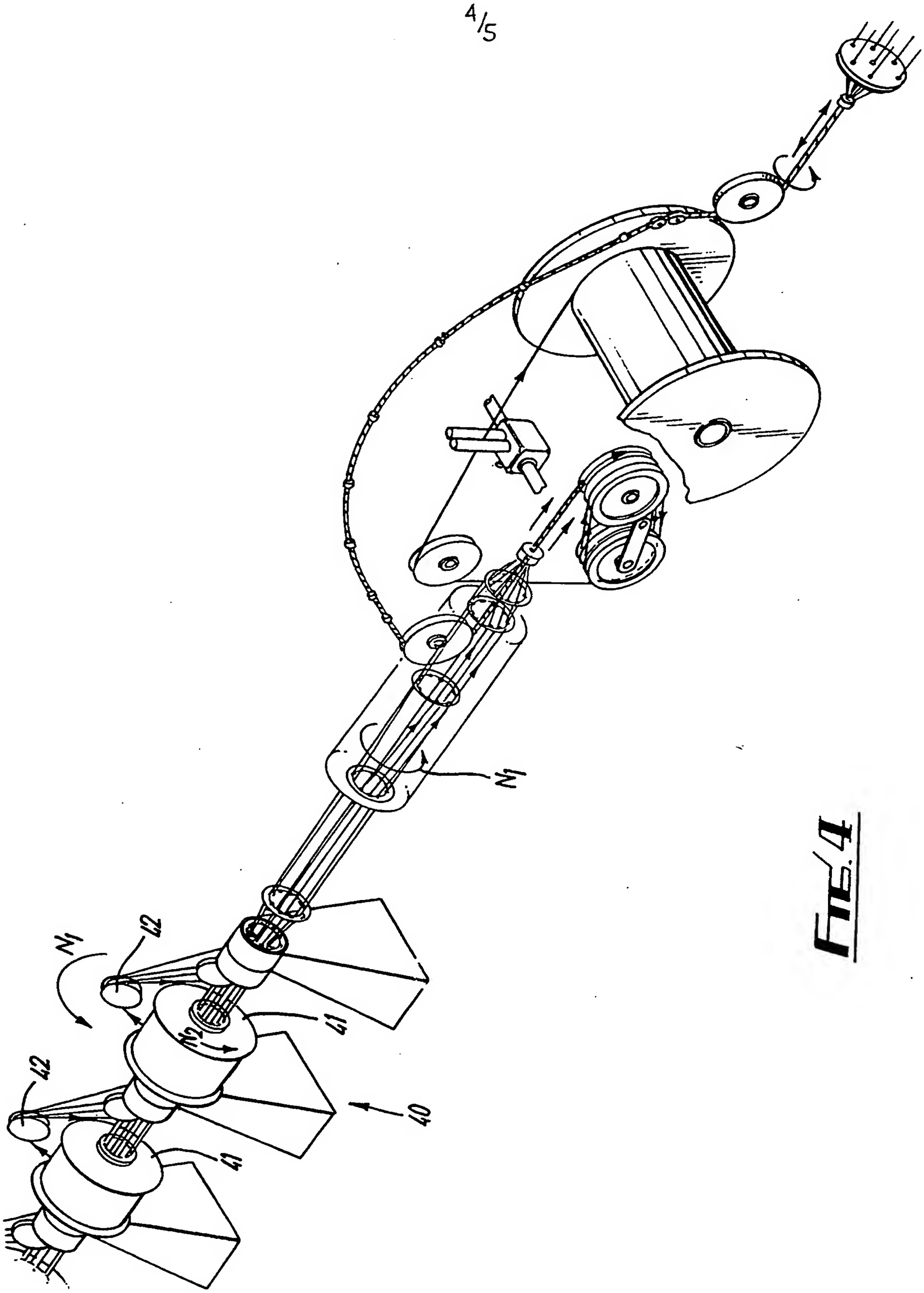

FIG. 4

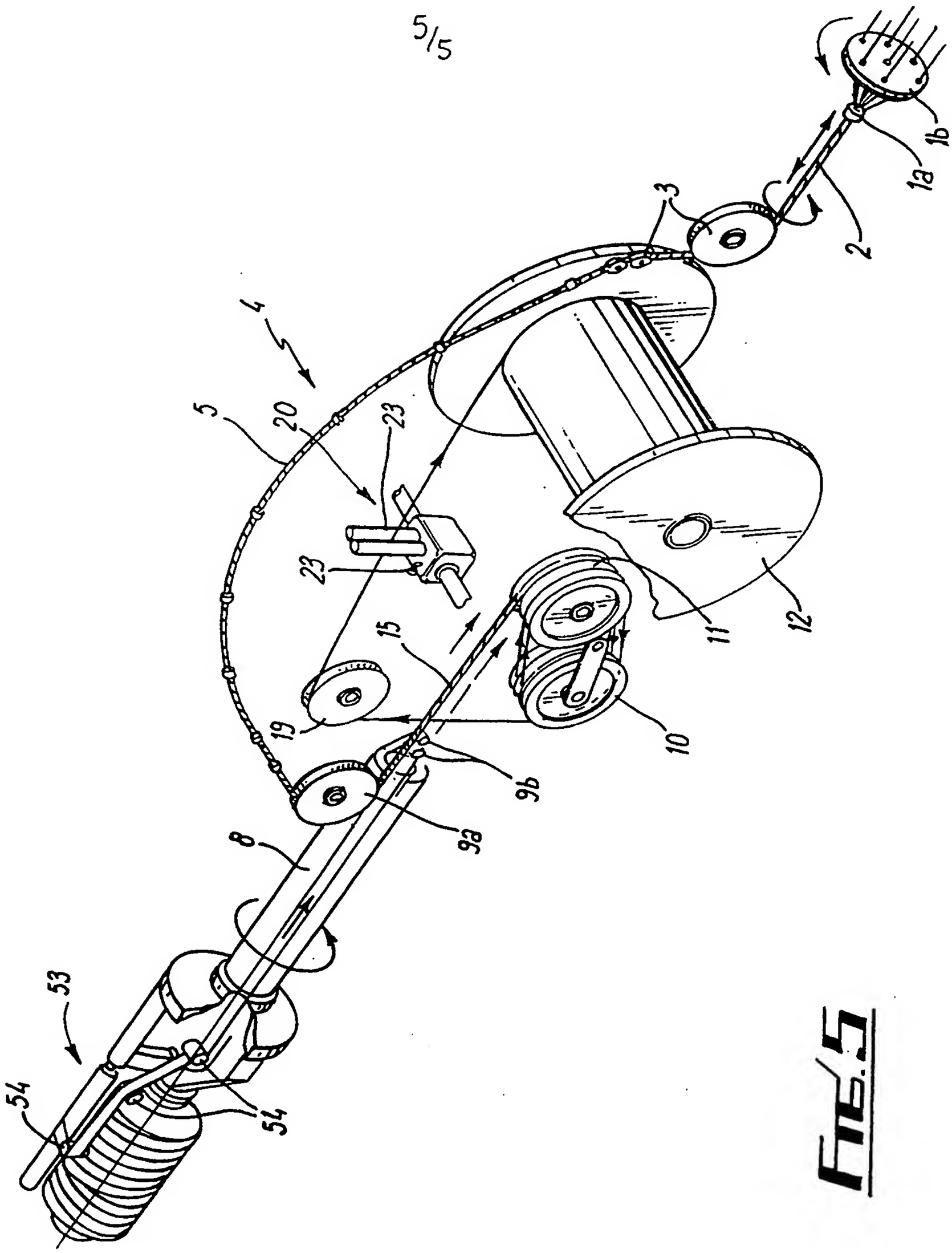

FIG.5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 94/01653

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 D07B7/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 D07B H01B

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Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE,A,22 64 105 (BRITISH INSULATED CALLENDER'S CABLE LTD.) 12 July 1973 see page 4, line 30 - page 5, line 18 ---	1,3,6, 15,19
A	FR,A,2 354 413 (THE GENERAL ENGINEERING CO. (RADCLIFFE) LTD.) 6 January 1978 see page 2, line 29 - page 4, line 29 -----	1,2,4-6, 15,19

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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